

UNITED STATES  
DEPARTMENT OF THE INTERIOR  
BUREAU OF LAND MANAGEMENT

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An Improved Method of Making a Photographic  
Record of Range Conditions

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AN IMPROVED METHOD OF MAKING A PHOTOGRAPHIC  
RECORD OF RANGE CONDITIONS

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AN IMPROVED METHOD OF MAKING A PHOTOGRAPHIC  
RECORD OF RANGE CONDITIONS

Summary

1. A general and a closeup view taken at certain marked points will provide a satisfactory record of range conditions when repeated annually and correlated with climatic and stocking information. The two views are taken at angles ordinarily used during an inspection on the ground and therefore can readily be interpreted by stockmen and technical men alike. Standardization of methods will aid in detection of trend in vegetation.
2. Marking of plots for the closeup picture is done by driving two  $3/4$  inch galvanized pipe spaced 6 feet apart and lined in a north and south direction. A scale marker with label is set over the north stake to be included in both photographs.
3. For the closeup view the camera is supported on a tripod set over the south stake at a height of 54 inches and directed downward at an angle of 58 degrees from the vertical to bring the scale marker into the center of the picture. With this camera angle the foreground of the picture will appear at an angle of 45 degrees. For the general view the camera is placed 35 feet south of the plot and directed at an angle to include the foreground, the plot and the horizon. In both views the back of the camera is tilted to bring foreground and the distance in sharp focus.

## Summary

- 4 The camera model recommended is a 4" x 5" view with double extension bellows, tilting back, and lens which has a focal length of 135 mm.
- 5 A square foot grid should be drawn to be printed in combination with the closeup negative. This grid will aid in making comparisons between pictures taken at different camera heights.
- 6 Filing of negatives can be done satisfactorily by using the correspondence filing system now followed by the Bureau of Land Management. This system will group the negatives by subject. Filing of prints can be done most conveniently with reports which assemble the information for certain range allotments or projects. As the record builds up it will be advantageous to have the entire series of pictures of each plot together for comparison.

The method proposed consists of taking photographs of certain marked sample areas and later repeating the operation to show trend of vegetation changes. A general and a closeup view is taken at each point to record conditions important in each selected area. The method is especially suited to illustrate changes in vegetation and soil erosion over ranges where management problems exist and on areas where soil and moisture improvements have been placed. The before and after pictures constitute convincing evidence of the results with a minimum of field and office work. They can readily be interpreted by stockmen and technical personnel since they represent views at angles ordinarily

taken during an inspection on the ground. The development of each plant can be traced and changes in vegetative cover correlated with management and climatic factors. The method can be made most effective by uniformity in technique.

The photographic method of recording range conditions is common and has been used in some form in many localities by different agencies. In this region it has been used in one grazing district and in two soil and moisture conservation project areas. Marked plots have been photographed vertically and at an angle, in single and stereoscopic views and on miniature color film and on larger black and white film. As a result of this experience a procedure has been developed and equipment selected which will secure a uniform and satisfactory record.

It is important that the procedure be standardized within a region and as far as possible in a bureau in order to establish a common basis for interpretation among all employees and among readers of illustrated articles published by the bureau. The standardization involves height of camera, angle of view, focal length of lens, size of negative, contrast, definition, color values, timing with grazing season, and filing record. When these factors have received systematic treatment the comparisons between conditions on different photographs can be made at first glance.

A standard method put into practice with needed preliminary instruction will improve the quality of photographs where hit and miss methods have been used previously. Photography has not received adequate

attention in the training program of the bureau even though there has been a continuous demand for pictures which effectively illustrate the conditions of general interest in a way which will appeal to all. The method described in this article requires technical precision which heretofore has not been considered necessary by many who have taken only "snapshots." While the type of camera recommended requires a number of careful adjustments, it is believed that a few setups with proper care will establish the procedure in the mind of any technician who has aptitude for that activity.

The equipment used on photo observation plots in Region III in 1950 included a 4" x 5" view camera with F 4.7, 135 mm lens, 1 second to 1/400 second between lens shutter, tilting back and other adjustments. A rigid tripod with pan, head and exposure meter were taken, also as essential accessories. The center marker is constructed of oak one inch square and 18 inches high. The metal attachment holds a card 3" x 5" in size used to label the photo. The stakes set as permanent markers are galvanized 3/4 inch pipe 2 feet long. One end of each stake is painted orange for 8 inches of the length. The stakes are driven down to a depth of 18 inches leaving the orange painted portion exposed for easy identification and for a gauge of the change in soil level. The stakes are set 6 feet apart preferably lined in a north and south direction. This distance between stakes is desirable since the resultant angle is 45 degrees over the foreground and since the camera is near enough to show seedlings and other detail near the ground which is

important in the grass and sagebrush vegetation common in the region. For types containing large brush species it may be necessary to increase the distance between stakes and raise the camera position.

The location of staked observation plots must be described in detail to facilitate return by personnel who were not involved in a previous visit. This can be done effectively by ties to section corners or by the use of a reference point easily identified along well-established roads. A painted post should be planted near the road if no other satisfactory object is available. Orange color is best suited for contrast on most ranges.

For the closeup view the camera is set  $4\frac{1}{2}$  feet over the south stake and turned to center the scale marker which has been placed over the north stake. In this position the camera will be tilted at an angle of 58 degrees from the vertical. The foreground will include surface two feet in front of the stake and on this foreground the angle of view will be approximately 45 degrees. At the nearest point the ground level will be located approximately 6 feet from the lens while at distant edge of the view the distance will be 17 feet. To bring the surface into focus for the entire range of distance it is necessary to tilt the back of the camera, moving the top backward until the foreground as well as the distance is equally sharp. The focus should be at the ground level where sharpest detail is desired and not on the label inserted on the center stake. The closeup view described above may be supplemented by an extreme closeup. Focusing and extra light allowance for this type of picture are described in a subsequent paragraph.



The focusing with tilted back is the critical step in camera adjustment. Sharp definition can be assured by use of a low power magnifying lens on the ground glass. The amount of tilting on average views can be marked on the mechanism. Little further adjustment is necessary where surface is reasonably level. Depth of field can be obtained to considerable degree with a fixed back if a small opening such as F 16, is used on the lens, but in situations where wind and poor light conditions are encountered the slow shutter speed needed with the small lens opening is likely to show movement of tall grass and slender branches of shrubs. The tilting camera back will allow shutter speed which will stop the movement of the vegetation and produce a negative which will enlarge without the fuzzy foreground and background seen in many range pictures. On windy days  $1/25$  second is fast enough if the exposure can be taken during a lull in air movement.

The general view should accompany the closeup to show how the marked site compares with adjoining area and how it may be influenced by conditions on adjoining area. It represents a perspective which a person would ordinarily observe in his inspection of the range. The general view is evidence to show that the closeup photograph selected for detail study is typical of the wider area which it represents. In some range areas the general view may be taken only at intervals of a specified number of years but it should be included in the initial round.

For the general view the camera is set 35 feet back (south) of the closeup location using the same height of camera and a horizontal angle to include 1 inch of the sky on the ground glass except where the

background is steep. The gage stick is left in place to show the location of the permanent stakes. The back tilting will bring foreground and horizon in sharp focus. A small diaphragm is preferred to bring heads of tall grass and shrubs of foreground in focus as well as detail at the ground. With the tilting adjustment of the camera back it is not necessary to sacrifice shutter speed to the point where movement of vegetation becomes objectionable. The procedure for general views as explained above will apply to most pictures taken of the range itself or with the range in the background.

Contrast is often lacking in range photographs because of the even toning which is characteristic of most aspects of the range and because of hazy sun or cloudy skies. Where such conditions are met a correction can be made in the processing. Film development should be given extra time to produce additional contrast.

Panchromatic film should be used to give desirable tone values to all colors. An emulsion speed of 100 is preferred to allow use of small lens openings. The 100 speed is sufficiently fine grained to allow enlargements up to 6 diameters if fine grain developer is used and a 4" x 5" negative at 6 diameters will allow blowups to meet ordinary needs. However, where extreme enlargement is expected film speed of 50 (ASA) should be selected to insure adequate definition. Sheet film is preferable to film packs because of lower cost, convenience in processing, better selection of film type. A majority of professional photographers claim the emulsion on sheet film is superior to that on film pack. The cost is the principal factor in favor of the

sheet film, it being approximately sixty per cent of that of film pack. A supply of twelve holders will provide film for a day of range condition photography.

Color photos for plot record work generally do not have sufficient advantages to justify the use of color film. Color aids in the identification of the plants and shows vitality of the growing vegetation. Because of the cost, slow emulsion speed and difficulty in reproduction, the use of color film should be limited to special cases.

Range condition should be photographed near the end of the grazing season when practicable. Special problems may require additional photos at the beginning of the season or at the time of greatest growth. In some range areas it may not be necessary to retake the marked plots every year.

Notes should be taken with each photo listing climatic conditions, seasonal growth, utilization of forage and stocking. In taking the initial picture of the plot a rough sketch should be drawn to aid in identifying the plants appearing in the view. Retakes should be accompanied by notes on new plants which have made their appearance.

The label card will indicate the location and date of the photo. The printing can easily be read on the label if a large black crayon is used. Cards can be lettered in the office before sub-quantial inspection trips are made. The label card assures positive identification of the negative.

A grid overlay should be drawn on transparent base to show square feet on the closeup view. The grid placed over the photo will show the relative location of plants and the approximate coverage of each species. It can be printed in combination with the contact negative or enlargements if desired. The grid will vary with the height of camera, the angle covered by the lens, and will also be affected by tilting of the camera back. The lines will be quite accurate for reasonably level sites. The square foot grid for any certain camera and lens may be photographed on a level site by setting spikes around the field at one foot intervals and laying white cord in both directions. The photo of this grid is taken according to directions for the closeup shot. A grid can be compiled by formulae for certain camera height and focal length.

Considerable time is required for notes, staking and photography of permanent observation points. Ordinarily most of the work is done in fall when good light conditions can be expected for relatively few hours of the day. A total of 10 plots will require a full day including travel time between stops. However, quality should not be sacrificed in order to obtain quantity since substandard photographs represent a waste of time and material. If a photograph of range vegetation does not show detail and contrast it is practically worthless for reproduction in newspapers and magazines.

For best results in photography of the range a 4" x 5" view camera with tilting back is recommended. Definition and detail must be

obtained to produce usable pictures. This type of camera is not suitable for action shots and a camera built for action shots is not ideal for use in recording range conditions. Without the back tilting adjustment overall sharpness can be obtained only by using fast film and a small diaphragm stop.

Use of a negative smaller than 4" x 5" is definitely a mistake because of the sacrifice of definition involved. Contrary to the general belief, to meet the standards required in range photographs miniature cameras require greater skill in operation than larger sizes. A satisfactory grade of 35 mm camera will cost as much as a good 4" x 5" camera and demands greater precision in operation. Miniature films require special processing usually not available locally in commercial plants. All negatives will require enlarging and very few will make satisfactory 8" x 10" prints because of blemishes and grain. The only advantages consist of compactness and convenience in transportation, and these factors would be important only if the inspection trip covers great distances on foot or horseback. If such a trip is contemplated a good folding 620 size camera and compact tripod is recommended. Thirty-five mm color slides of selected photo plots would be useful for illustrating lectures based on photo and other records.

A double extension of bellows is desirable for photography of young seedlings, flowering heads for identification, soil sections and other subjects to supplement the closeup and general views where desirable. In setting up the camera for natural size pictures the distance between the lens and subject is measured as double that of

the focal length. Focusing is done by moving the back of the camera and leaving the lens at the same point while the adjustments are made. This procedure is possible only with view cameras. With other cameras the bellows are extended to double the focal length and the whole camera is moved until subject comes into focus. If the bellows are extended to triple focal length and subject at a distance of one and one-half times focal length the image will be enlarged to double natural size.

A light factor enters into the diaphragm setting in instances where bellows are extended more than in ordinary views. The f stops on the camera are determined by dividing focal length by diameter of the aperture. The amount of light admitted through lens varies inversely with the square of the f numbers. However, as the camera is extended much beyond the focal length (infinity on the foot scale), the f stop is no longer a reliable index of exposure since the light reflected from the subject is distributed over a larger area of film. The correction is made according to the following formula:

$$\text{Effective f number} = \frac{\text{Lens to film distance} \times \text{f stop used}}{\text{Focal length of lens}}$$

Thus when taking a natural size photo with lens set at twice the focal length the effective f number is twice that shown on the diaphragm scale and the relative amount of light calculated on the basis of the squares of these numbers. If the f number used is 8 the effective number is f 16 and this is only 1/4 of the light indicated by the f scale on the camera ( $8^2 : 16^2$ ).

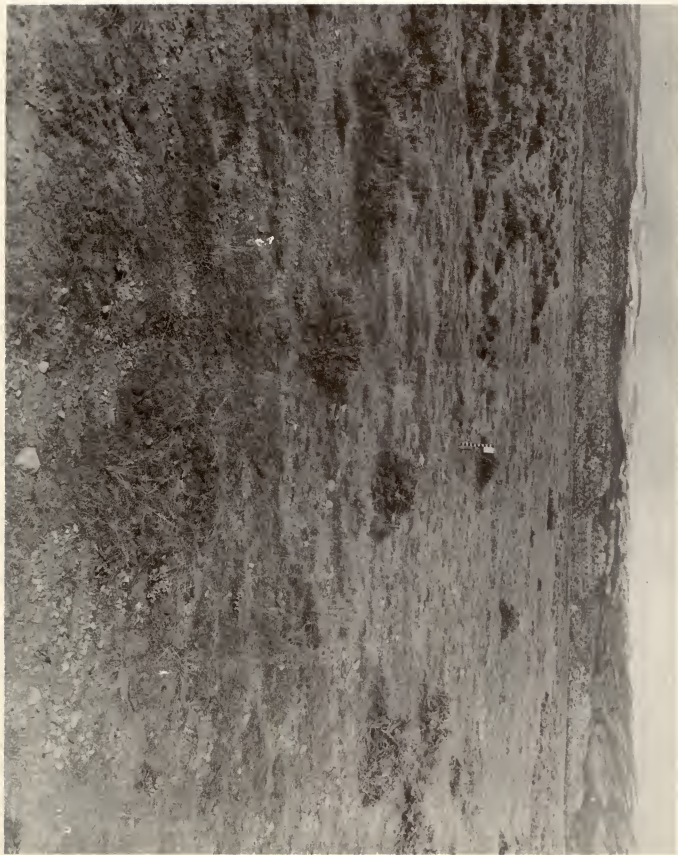
### Filing

Each negative should be kept in a 4" x 5" negative file which has been ruled for specific data as shown on accompanying chart. The filing should be according to the correspondence filing system in use by which certain key letters are assigned to each division. Where a picture may be used for more than one subject a cross reference should be made on a single cardboard sheet similar in size and shape to the negative envelope.

Filing of prints will be in reports which assemble information on certain range allotments or projects. As the record builds up it will become advantageous to place together the complete series of photographs for each plot.

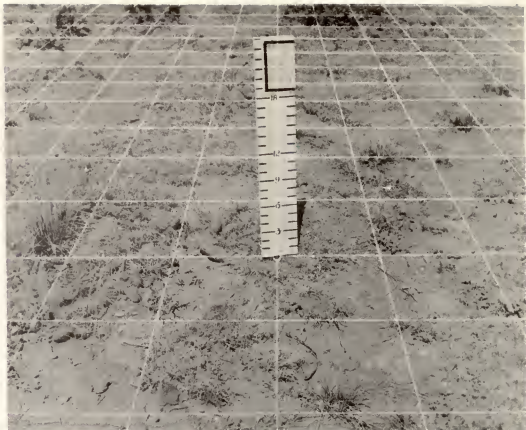
|          |       |             |
|----------|-------|-------------|
| File     | _____ |             |
| Dist.    | _____ | Class _____ |
| Project  | _____ | Type _____  |
| Plot No. | _____ | Date _____  |
| Remarks  | _____ |             |
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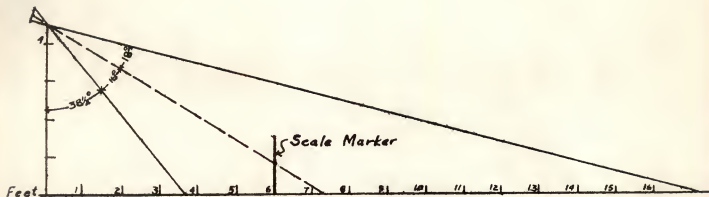




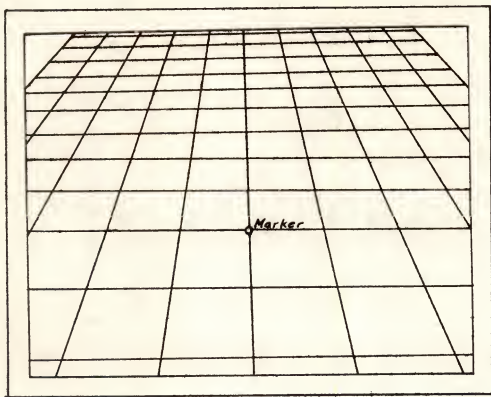


The 1943 and 1950  
views of the plot  
shown on preced-  
ing page printed  
in combination  
with grids drawn  
to fit the camera  
size and camera  
height in each  
case.





Vertical angle of view and depth of field covered with a 4" x 5" camera equipped with a 135 mm lens and supported on a tripod 4½ feet above ground.



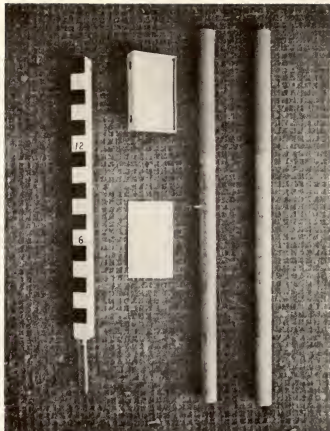
Square foot grid showing perspective obtained in the field of the camera view illustrated in preceding figure. This chart was traced from a photograph taken of strings spaced on the ground at one foot intervals.

Plot record picture  
shows lack of detail  
except in foreground.



The 8" x 10" enlargement on next page shows the possibilities in depth of field attained with a 4" x 5" view camera. This is a general view taken of one of the permanent observation plots in Bridger Grazing District. The camera is set at a distance of 35 feet from the marked plot and the camera back is tilted for foreground and distance. Definition is satisfactory at 6 feet and at 6 miles.

Photo to the right shows parts of the scale marker which is set over the north stake each time the plot is photographed. The  $\frac{3}{4}$  inch galvanized pipes are driven down 6 feet apart to mark the location of permanent plots. An orange painted 8 inch top portion of stakes is left above ground.



The view below shows the camera and scale marker in position for a closeup of a permanent photo observation plot established in Bridger Grazing District.



View at the right  
taken in 1943  
with a twin lens  
reflex fitted  
with a 73 mm lens  
Camera height was  
40 inches.

Below is a view  
of the same plot  
taken in 1950  
with a 4" x 5"  
view camera with  
a 135 mm lens.  
Camera height  
was 54 inches.  
Wider angle  
includes addi-  
tional field  
horizontally and  
higher camera  
position shows  
different per-  
spective. Note  
the denser stand  
of grama grass  
but closer use  
in 1950.

